from the fact that it was but small over the greater part of the Mediterranean, and so for long the deep-sea sailors of Europe were without much experience of its effects. When it did force itself on their notice it was supposed to be due to an error of construction, and a correction was made so that the point marked north on the card pointed to the astronomical north.

The importance of Gilbert's "De Magnete" has only been fully seen in the light of modern magnetic research. It constituted in itself an advance which has not been equalled by any single step during the three hundred years that have elapsed since its publication. So far as observation and theory have yet gone, even with the aid of Gauss's refined analysis, they have only confirmed the conclusion there set forth, *Magnus magnes ipse est globus terrestris*—"the earth is a great magnet." It is of great importance to decide whether or not the earth is a permanent magnet like a piece of steel, but the decision that its magnetism is induced by currents of electricity will not in any way contradict Gilbert's assertion.

Magnetic survey work has of course its own practical and commercial importance, but in a country like America, where public and private boundaries have been laid down by the compass, the determination of the secular variation is of peculiar interest. Without it the results of early land surveys could not now be interpreted.

In all cases the earlier surveys in America were compass surveys, and the directions referred to the magnetic meridian. Hence, as the deviation of the magnetic from the true meridian was known only in a few cases, the directions laid down in old topographical maps and plans of estates can only be recovered by determining the deviations now, and applying the known value of the secular variation. And Dr. Bauer says that one of the Eastern states actually still retains the magnetic meridian as the legal meridian of reference for land surveys. We had thought that such conservatism was unknown on the other side of the Atlantic.

Dr. Bauer quotes Robert Norman's own account of his discovery of the dip.[1] It has been quoted before, but not many have seen it, so we venture here to make a short extract. After stating that he had repeatedly found needles which had been finished and balanced before magnetisation inclining themselves to the horizontal with the north pole down when magnetised by being stroked with a lodestone, so that he had to "put some small piece of wire on the south point, and make it equall againe," but had put the result down to defect of construction rather than to "anie such propertie in the stone," he goes on: "It chaunced at length that there came to my hands an instrument to be made with a needle of sixe inches long, which needle after I had polished, cut of a just length, and made it stand levell upon a pin, so that nothing rested but onlie the touching it with the stone; when I had touched the same, presentlie the north part thereof declined down in such sort that being constrained to cut awaie some of that part to make it equall againe, in the end I cut it too short, and so spoiled the needle wherein I had taken so much paines. Hereby being stroken into some cholar, I applied myself to seeke further into this effect. . . ."

The first systematic surveys were made by William Whiston, better known perhaps as the translator of "Josephus." He was active in carrying on magnetic observations with a view to the determination magnetically of geographical position, and first drew isoclinics, made relative intensity observations, and invented the vibration method of obtaining the dip. His main object was to obtain the prize offered for the best solution of the problem of determining the longitude at sea, and he seems to have been successful in enlisting the interest of the Court, and even in obtaining money grants in aid of his work. Although the problem of the longitude was to be quite otherwise solved, Whiston's researches were of very great value. From Whiston to Gauss is a hundred years, but the next great development in terrestrial magnetic science came when Gauss introduced absolute measurement, and thus led observers to express results in units independent of arbitrary constants, so that they were at once available as data for other investigators. As a result the science has gone on vigorously from then till now developing in interest and importance. This, of course, is only one part of the effect of Gauss's work: it has been equally, if not more, productive of progress in the science of pure and applied electricity.

With respect to the conduct of magnetic survey work generally, Dr. Bauer makes some remarks which it would be well if observers would bear in mind. Much time and labour has been practically lost by the observation of only a single element, such as the declination. As he says, fully 75 per cent. of the time and money spent on a survey is spent in *occupying* stations, and the remainder only in observation. Thus it is only a very little further expense comparatively for an observer to observe a little longer, and get with sufficient accuracy values of all three elements. Thus magnetic declination surveys are of little value by themselves, except for the land surveying application, and those which have been carried out in many places could have been rendered many times more valuable to science by a very trifling additional outlay.

The initiation of terrestrial magnetic work by the British Association, the magnetic surveys carried out in this country by the British Association, and described in Sir Edward Sabine's Report for 1861, the more recent elaborate surveys by Thorpe and Rücker, and the work done in other parts of the world, are all appreciatively referred to.

Now that the British Association has again taken up the work in a very special manner, and a magnetic committee has been appointed, we may confidently expect to see a further great development of the subject. The work done by the conference at Bristol, under the presidency of Prof. Rücker, is a valuable instalment.

A. GRAY.

PROGRESSIVE EDUCATION.[1]

THE publication of the second and third volumes of the series of reports prepared for the Education Department under the supervision of Mr. Michael E. Sadler, the Director of Special Inquiries, again calls the attention of educationists to the value of the work which is being performed by this latest addition to our national machinery for the guidance and co-ordination of educational effort. These reports, with their predecessors, closely resemble in their scope the publications of the U.S. Bureau of Education, and accentuate the fact that we have only lately commenced to do what has been for some time the established custom in the States. Just as the man of science acquaints himself with the work, failures and successes alike, of previous investigators in the field of his own activity, so to do the best possible work, the teacher, who is also an experimenter, should similarly become familiar with what has been accomplished by other teachers in different parts of the world. With these reports to hand, and others which will doubtless follow, there is no reason why the schoolmaster should not, in the future, start the education of his pupils armed with the experience of many successful veterans.

Though every one of the 1389 pages included in these volumes contains something of interest, this article is to be concerned more especially with what there is to be learnt concerning the present state of the teaching of science—whether in this country or abroad. Of the many plans of treatment which suggest themselves, perhaps, as reference to the volumes will be thereby facilitated, it will be best to take the papers containing important allusions to scientific instruction in the order in which they occur in the volumes themselves.

THE LONDON POLYTECHNIC INSTITUTES.

The London Polytechnic has but little resemblance to the institutions to which a similar name is applied in France, Switzerland, and Germany. Each Polytechnic Institute (of which there are at present eleven, with four branches) is an independent organisation which deliberately combines social intercourse, recreation, and instruction. As educational institutions these polytechnics constitute a new and distinct type; they range from the "Upper Standard" day school for boys and girls of thirteen, up to high University instruction and post-graduate research. All kinds and grades of work go on simultaneously. In one room boys of twelve are learning arithmetic, or girls of thirteen are being taught to sew; in another, classes of plumbers or bricklayers, compositors or tailors, are being practically trained in the processes of their respective crafts; close by is the smithy or the fitting shop, crowded with young engineering artisans; in other class-rooms are groups reading Dante or studying economics; and just at hand are well-equipped physical and chemical laboratories where

---

[1] From his book, "The New Attractive," &c., 1576.

[1] "Special Reports on Educational Subjects." Vols. ii. and iii. (Issued by the Education Department, 1898.)

(as at Battersea this year) the teacher with a selected band of students is working out a Royal Society grant for research, or (as at Chelsea) graduates of more than one University are preparing their theses for the doctor's degree.

Six of the polytechnics now possess day schools and these have together about 1600 pupils, who are chiefly between twelve and fifteen years of age. Two of them are mixed schools for boys and girls, one has separate departments for the sexes, and three are confined to boys. They are in the main to be regarded as technical continuation schools. Seven day schools of a special type—the Domestic Economy School—are also attached to various polytechnics. In these the whole time of the pupil is spent in the study and practice of cookery, dressmaking, plain needlework, laundry work, and housewifery, with some elementary lessons in the chemistry of food and the physiology of hygiene. At Chelsea there is also a training school for servants.

At least 5000 workmen are at present attending the trade classes in connection with the London polytechnics. Not only is there a class in each branch of the building, engineering and metal, furniture, book and printing, and clothing trades, but also in such miscellaneous trades as baking, basket-making, and gas manufacture.

One polytechnic after another has found itself pushed into providing day instruction of various kinds, by the demand of students for whom evening classes are inaccessible or unnecessary. Thus the Battersea Polytechnic has regular day courses in mathematics and science, building and machine construction, wood-work and metal-work. The East London Technical College and the Regent Street Polytechnic have each a regular day engineering department, which turns out fully equipped engineers and electricians. At Regent Street a day architectural school has just been added. The Birkbeck Institution has a rapidly growing day department in natural science, including systematic courses in physics, chemistry, and biology. There are also day classes in Latin, Greek, and French, up to the standard of the B A. degree of London University. At Chelsea there is a fully developed Technical Day College for men and another for women.

More than one provincial city, proud of its "University College," counts fewer systematic day students than a single London Polytechnic.

In the science laboratories of the polytechnics every attempt is made to render the instruction both practical and scientific, and in addition to the crowds of elementary pupils there is generally a small body of enthusiastic advanced students who spend every hour they can spare in the laboratory, carrying on original research under the personal direction of the lecturers and demonstrators. This is sometimes systematised into what, in a German University, would be called a "Seminar." The research course at the Chelsea Polytechnic, under the direction of Mr. Herbert Tomlinson, F.R.S., may be cited.

The subject selected for the first research is "The effect of repeated heating on the magnetic permeability and electrical conductivity of iron and steel." The investigations are being accompanied by demonstrations and lectures on (1) the best methods of annealing iron and steel and the faults incidental thereto; (2) the determination of magnetic permeability both by ballistic and magnetometric methods; (3) the determination of the electrical conductivity of magnetic metals; (4) the critical temperature of iron and its alloys.

The method of conducting the research is, too, worthy of mention. To begin with, the principal selects some suitable subject, and fully explains to the class his reasons for such selection. He then gives a brief history of what has been previously done round and about the subject, and propounds a mode or modes of attacking the research, inviting criticisms from the class. The mode of attack having been decided upon, the class is expected not only to take part in the experiments but to help in making necessary apparatus. Should the results obtained be of sufficient importance, they are to be offered in the form of a paper to such societies as the Royal Society, the Physical Society, or the Institution of Electrical Engineers.

Enough has been culled from Mr. Sidney Webb's paper to show that the London Polytechnic is a pure addition to the educational system, neither competing with nor superseding existing institutions. There are, among all the 50,000 members and students of these new establishments, probably not a dozen who would have been found joining University or King's College had the polytechnics never come into existence. There is, Mr. Webb says, every indication that the whole 50,000 are a net gain, and represent the arrival of a poorer class of students than the University Colleges have as yet reached.

SCIENCE IN GIRLS' SCHOOLS.

Mrs. Bryant, headmistress of the North London Collegiate School for Girls, in a paper on "The curriculum of a girls' school," while admitting that the scientific interest arises almost as early in a child's mind as the literary and human interests, lays it down that the power to satisfy it develops much more slowly, so that the progress made is comparatively insignificant, even when the time spent is considerable and the methods sound. Nevertheless, it is recognised that the youngest children of school age are capable of elementary work in natural history. Such work at the beginning can hardly be called natural science, but it is of the nature of science if rightly carried out. An hour a week, increasing to two hours, may thus be profitably spent. At eleven or twelve children enter on physical science by very simple experimental investigations of the properties of matter. The ideal of the school curriculum in physical science is, it is suggested, a course of general elementary physics, starting with easy measurements and leading up to chemical problems, and eventually to chemistry. Mrs. Bryant thinks it is better for girls to carry on chemistry as a special study than to pursue any of the physical branches to the same extent. It has been found that backward pupils, and those who enter school late, get their best chance of science by the pursuit of botany and natural history as regular studies, with occasional courses on quasi-scientific subjects, like hygiene. All the pupils should, at some period of their course, deal with the application of science to life in some form, hence, short series of lessons, during one term, on hygiene and domestic economy, should be arranged. An interesting note by Miss Edith Aitkin, the science mistress in the school of which Mrs. Bryant is headmistress, gives in detail how the science teaching in the North London Collegiate School for Girls is carried out.

THE HEURISTIC METHOD OF TEACHING.

The art of making children discover things for themselves is the meaning Prof. Armstrong applies to the expression Heuristic method of teaching, and he contributes a very suggestive article on this theme to the second volume of the reports. After what is best described as an autobiographical account of his gradually developed belief in this system, Prof. Armstrong sketches historically the work of the British Association Committee and the Incorporated Association of Head Masters in formulating a scientific and logical introduction to physical and chemical studies. In 1888 the British Association Committee reported at the Bath meeting, that the replies received to a letter addressed to the headmasters of schools in which chemistry was taught—"have put them in possession of the actual facts connected with the teaching of chemistry in schools, and have made it clear that something should be done in the direction of promoting a more uniform and satisfactory treatment of the subject. The Committee think that some suggestions might now be made as to the method of teaching chemistry which should be followed in schools. If this can be done, it will certainly confer a great benefit on both teachers and examiners, and will be likely to lead to a more emphatic recognition of the merits of the science as an instrument of elementary education."

Two years later the same Committee recorded that—"it cannot be too strongly insisted that elementary physical science should be taught from the first as a branch of mental education, and not mainly as useful knowledge. It is a subject which, when taught with this object in view, is capable of developing mental qualities that are not aroused, and indeed are frequently deadened, by the exhaustive study of languages, history, and mathematics. In order that the study of physical science may effect this mental education, it is necessary that it should be employed to illustrate the scientific method in investigating nature, by means of observation, experiment and reasoning with the aid of hypothesis; the learners should be put into the attitude of discoverers, and should themselves be made to perform many of the experiments."

In 1895 a committee, appointed by the Incorporated Association of Headmasters, prepared a detailed syllabus of instruction in elementary physics and chemistry on the lines sketched out by the British Association Committee, and this syllabus was adopted by the headmasters in 1896. This detailed schedule has had a marked effect, both upon the personal teaching in secondary schools, and also upon the character of the text-books which have been published from time to time for use in such schools.

Not only have many headmasters been won over to this newer and more intelligent mode of imparting scientific instruction, but the various examining bodies—the local examination authorities at Oxford and Cambridge, as well as the Senate of the London University—are all moving in the same direction. Examinations in elementary experimental science are becoming more and more practical. It is yearly becoming less common for examiners to be satisfied with verbal descriptions of scientific experiments, the candidates must be able to perform the experiments themselves and also draw the proper inferences from them.

In addition to other reasons why the heuristic method of teaching should be adopted, Prof. Armstrong claims for it that it conduces to the formation of moral and intellectual character and purpose. Children are encouraged to be properly inquisitive and inquiring; to observe correctly; to be neat and careful in all their work; to be economical; to attend patiently to details; to reason with judgment; to be handy, and to develop many other equally valuable characteristics.

For instruction in science to be carried out according to heuristic methods, ample room must be provided, but there need be no very special arrangements made. Prof. Armstrong enumerates the comparatively few necessaries in the way of fittings; they are: unfixed benches of the kitchen-table type, fitted with gas; one or two long sinks made of wood—elongated washing tubs; one or two benches fixed against the wall of the room, with cupboards (having a tray which will slide in and out) fixed in the space underneath; single draught-closet; considerable amount of wall space converted into blackboard; and free wall space, having upright battens affixed at regular intervals for attaching shelves or hooks. Apparatus should be provided to meet requirements as they arise, and "every effort should be made to utilise ordinary articles—medicine and pickle bottles, jam pots, saucepans, &c.—and to construct apparatus in the workroom; for this latter purpose a carpenter's bench and tools, vice and files, a small lathe, an anvil, and even a small forge should, whenever possible, form part of the equipment. Infinite injury is done at the present day, invaluable opportunities of imparting training are lost, by providing everything ready made." Centimetre-foot-rules, drawing-boards, T and set-squares, and balances *must*, however, be supplied. But the greatest of these is the balance. Says Prof. Armstrong, "altogether indispensable and essential as the primary weapon of heuristic instruction is the balance. There is no question that in the future the test of efficiency in a school will be the extent to which suitable balances are provided and used." Or, again, "the balance is to be regarded as an instrument of moral culture, to be treated with utmost care and reverence."

Appended to the article are the full courses of instruction in elementary science adopted by the Incorporated Association of Headmasters, and a course in botany framed by Prof. Marshall Ward, and included in the programme of the Joint Scholarships' Board Examinations.

PRUSSIAN SECONDARY EDUCATION FOR BOYS.

It is interesting to read, in the article entitled "Problems in Prussian Secondary Education for Boys," which Mr. Sadler contributes to vol. iii., of the part von Humboldt took in developing an effective plan of educational administration in Prussia. Humboldt was appointed Director of Public Education in 1792, and during the succeeding seventeen years was actively engaged in supplying the urgent need which was then felt for improved education. He insisted, among other things, that no one should be allowed to undertake higher education, even in private schools, who did not hold a certificate of competency awarded by a State authority. In 1808, he began to remodel Prussian secondary education; and the work of the succeeding ten years is carefully reviewed in Mr. Sadler's article. The eleventh section of this exhaustive inquiry is of especial importance at this time. It is concerned with the manner in which the growing need for more knowledge in the various branches of professional and commercial life has been met in Prussia. As Mr. Sadler says, "a really good secondary education, up to sixteen or nineteen as the case may be, does for a man what he can rarely do for himself in later years. It drills his intelligence, while the powers are still supple, and it presses into his mind, while the memory is still retentive and undisturbed by outside cares, a well-set foundation of necessary knowledge. But all over Germany these advantages have been made more accessible to the children of families of small means than is the case in England." It has been, moreover, a fixed principle in Prussia for some time, that the different types of secondary school should be kept distinct. "In the application of science to industry there has been an ever-increasing demand for young men of ability, well-trained in studies which equip them for business callings, instead of tending to estrange their sympathies from commercial life." The Education Department of Prussia now definitely accepts the idea of non-classical training as a part of a national system of higher education. The curricula and programmes of work for higher schools in Prussia, which follow the general article, should prove of great value in guiding English headmasters. That section which deals with natural science shows that in the gymnasium, or fully classical school, two hours a week are given in each form to the study of science. The teachers are instructed that "special importance is to be attached, not so much to the amount of what is learnt, as to the thoroughness with which it is studied." The endeavour must be "above all to guide the pupils to think and observe for themselves." In the Realgymnasium, or school with Latin only, and the Oberrealschule, or modern school, the amount of time given to science is increased in the higher forms to five hours a week in the Realgymnasium, and six hours a week in the Oberrealschule. It would take too much space to give a detailed account of the subjects, and the parts of them, studied in the different forms; but a reference to pp. 303–6 will give the necessary information.

HIGHER COMMERCIAL EDUCATION.

Mr. Sadler also contributes to vol. iii. an elaborate account of higher commercial education at Antwerp, Leipzig, Paris and Havre. The Institut Supérieur de Commerce at Antwerp aims at being a university for the future merchant, and at the special training of those to whom the consular service of the country will ultimately be entrusted. It is a public institution, under the inspection of the State, and its professors are civil servants. The Belgian government pays three-quarters of its annual cost, and the municipality of Antwerp the rest. Foreign students are admitted, and it is found that the associations thus formed are indirectly helpful to the furtherance of Belgian trade. The staff of the Institute consists of fourteen professors and two assistants, in addition to the director. To candidates who are successful in the final examination the Institute awards diplomas of merit, but these diplomas are not lightly given and are highly valued by business men. The diploma also qualifies a student to obtain one of the travelling scholarships awarded by the Government in order to encourage commercial inquiry. The scholarships are worth from 200*l.* to 250*l.* a year, and may be regarded as travelling studentships for commercial research.

One of the causes of the commercial advance of the German empire is the intellectual efficiency of the secondary schools, and of the higher Technical Institutes. "The secondary school is organised as the foundation, the higher Technical Institute as the crown." German non-classical secondary education prepares a boy to excel in commercial life, but the German secondary school authorities rigidly abstain on principle from any attempt at premature specialisation in commercial subjects. The first German Higher School of Commerce was last year established in Leipzig. There is to be a close correlation between this Higher School of Commerce and the University of Leipzig. The Director of the Leipzig School defines its objects "to be the raising of the position of the trading classes in social estimation, and their equipment with the higher level of expert knowledge which the conditions of modern industry require." Commercial opinion in Germany is not, however, unanimous in favour of the establishment of schools of commerce. Thus, in the Annual Report for 1897 of the Hamburg Chamber of Commerce the following remarks occur:—

"The science of business is a science which must be learned by practical experience. It cannot be picked up on the benches of a class-room. It must be acquired in practical life. A young man trained in a school of commerce will enter on practical life with his head full of all manner of preconceptions."

Mr. Sadler does not say much about the French Higher Schools of Commerce, but directs attention to the volume, "Commercial Instruction organised by the Paris Chamber of Commerce," which was prepared by that Chamber for the Chicago World's Fair of 1893. On the general question of commercial education, the following remarks are worthy of note. "All persons of experience heartily reprobate the thrusting of so-called 'commercial subjects' into the curriculum of secondary day-schools. To cram up little boys of fifteen with odds and ends of commercial law and generalisations of commercial geography is to waste precious time which might have been devoted to subjects not only more elevating in themselves but more digestible by youthful minds."

CONCLUSION.

The foregoing sketch of some of the questions dealt with in the volumes under consideration does not exhaust the references to scientific instruction and higher education contained in them. Scattered through the reports are short allusions to other considerations which accentuate the importance of a fuller recognition of the claims of science as an effective instrument in education; and it is a happy augury that official publications of this kind should recognise so completely the good results which follow upon according science an important place in the curricula of secondary schools.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE annual meeting of the Association of Technical Institutions will take place on Thursday next, January 12, when an address will be delivered by the president, Lord Spencer.

THE canvassing committee under the Birmingham University scheme state that the total sum promised up to the date of the public meeting in the Council House in July last (95,658*l.*), had already been increased to about 115,000*l.* Mr. Frank McClean, F.R.S., has contributed the sum of 2000*l.* to the fund. The Lord Mayor of Birmingham announces a donation of 1000*l.* from Alderman T. S. Fallows, J.P. The committee will hold their next meeting on January 25, after which a second list of subscriptions will be published.

A WINTER meeting for teachers opened at the College of Preceptors on Monday, and will continue in session until the end of next week. The meeting was inaugurated by an address by Sir Joshua Fitch, and the programme also includes lectures on educational subjects, visits to educational institutions, a conference on the training of modern language teachers, a conference on science teaching, and a conversazione at the Clothworkers' Hall. The lectures will deal with the training of teachers, the practice of education (including the teaching of geography and of the "life sciences"), psychology applied to education, physiology applied to education, school hygiene, the training of the speaking voice, and other subjects. The conference on science teaching will be held at the South-West London Polytechnic, Manresa Road, Chelsea, next Thursday and Friday, and will consider the methods of teaching elementary experimental science (physics, chemistry and mechanics) in schools. In connection with the conference there will be an exhibition of apparatus used in schools for practical science teaching.

THE annual meeting of the Geographical Association will be held at the College of Preceptors on Wednesday, January 11, when an address will be given by the President, Mr. Douglas W. Freshfield. The Association was founded in 1893 with the object of improving the teaching of geography in secondary schools, and every one acquainted with what usually passes for geography instruction in such schools will acknowledge that there is much room for improvement. Rational methods of teaching experimental sciences are now being introduced into many schools, and geography ought to be brought into line with the new movement, for, when properly taught, it has a distinct educational value. All methods of science teaching which bring into play the pupil's intelligence, instead of merely loading the memory with names and isolated facts, should be encouraged; and as the work of the Association consists in spreading knowledge of improved methods of teaching geography, it deserves support. Intending members should communicate with Mr. J. S. Masterman, 55 Campden House Road, London, W.

A *Times* correspondent at Bombay reports that, on Saturday last, Lord Curzon received a deputation from the provisional committee of the proposed Imperial University, or Research Institute, to be established in India for the purpose of post-graduate instruction in the higher scientific and technical branches of learning. The petition referred to Mr. J. N. Tata's offer of property, representing a capital of 30 lakhs, and producing an income of a lakh and a quarter rupees, on trust to found an Imperial Institute, which it was thought would supply, with the help of the Government, the Native States, and the general public, this existing need. The present scheme was to found a separate institution open to graduates of all existing Universities, and fully equipped. The provisional committee submitted a draft Bill which had been prepared for the approval of the Government of India, with a scheme of studies and an estimate of the probable initial expenditure. The initial expenditure was put at 15 lakhs, and the annual charge at 3 lakhs. The committee asked for the support of the Government of India, as the proposed University was intended for all India, and, being Imperial in character, deserved special consideration from the supreme Government. The committee further requested the Government to sanction a grant in aid towards the annual expenditure, remarking that the Secretary of State for India would favour such a grant. If the Indian Government proposed to extend a grant in aid to higher studies, the native Princes would cordially co-operate. Some of them had contributed to the Jubilee Health Institute, ths object being bacteriological research, which fell within the confines of the committee's draft scheme. They suggested the amalgamation of the resources promised by the native Princes to the Jubilee Health Institute with Mr. Tata's donations, and pointed out that considerable funds had been raised in the Punjab and Haidarabad for research purposes. Lord Curzon, in reply to the deputation, said that he had carefully examined their representations, and, though he could, of course, give no final answer, he could, at all events, assure them that the object which they had in view had enlisted his warm sympathy.

PRESIDENT CRAFT'S annual report of the Massachusetts Institute of Technology shows that the past year was a remarkable one in the financial history of the Institute. More money was received through bequests and gifts than in any previous year. Under the will of the late Hon. Henry L. Pierce, seven hundred and fifty thousand dollars were paid to the Institute by his executors. This is the largest sum ever given to it by any one benefactor. In addition to this, the executors of the late Mrs. Julia B. H. James have paid over the very notable sum of one hundred and forty thousand and five hundred dollars, this being also one of the largest gifts ever made to the Institute. Mr. George A. Gardner has generously given twenty thousand dollars as a fund, the income from which is to be used in the payment of salaries. Ten thousand dollars came from the late John W. Carter, and fourteen hundred and eighty-two dollars has been added to the large sum previously received from the estate of the late Mrs. Susan E. Dorr for the Rogers Physical Laboratory. Besides these gifts to the Institute itself, a Travelling Fellowship in the Architectural Department has been established by the will of Mr. Willard B. Perkins. For this purpose the sum of six thousand dollars has been given, the accumulated income from which is to be used every fourth year. Forty thousand dollars came from the estate of the late Mrs. Ann White Dickinson, the whole sum for scholarship purposes. A friend has given five hundred dollars to meet a special want, and two hundred dollars has come from Mrs. William B. Rogers, to be used for periodicals. It is expected that the Institute will receive four hundred thousand dollars from the estate of the late Mr. Edward Austin. This amount appears to be intended for scholarships and other similar uses, and will be highly appreciated; but the great desideratum for the immediate future is accessions to the unrestricted funds of the Institute.

The actual expense of instructing the students at the Massachusetts Institute is on the average three hundred and thirty dollars per year, while only two hundred dollars is paid as tuition fees. The balance, one hundred and thirty dollars, including interest on permanent investments, land, buildings, machinery, &c., has to be met from the past and present government and private benefactions. All through the reports from the different departments of the Institute notices are given of the introduction of advanced studies in consequence of advanced entrance requirements, and the school is making continued progress towards a higher standard for its degree. Another noteworthy feature is the progress towards a greater subdivision of students into small sections in laboratories, and the constantly increasing value placed upon laboratory work. During the past four years this movement has led to the appointment of eighteen new instructors, while the total number of students has remained about the